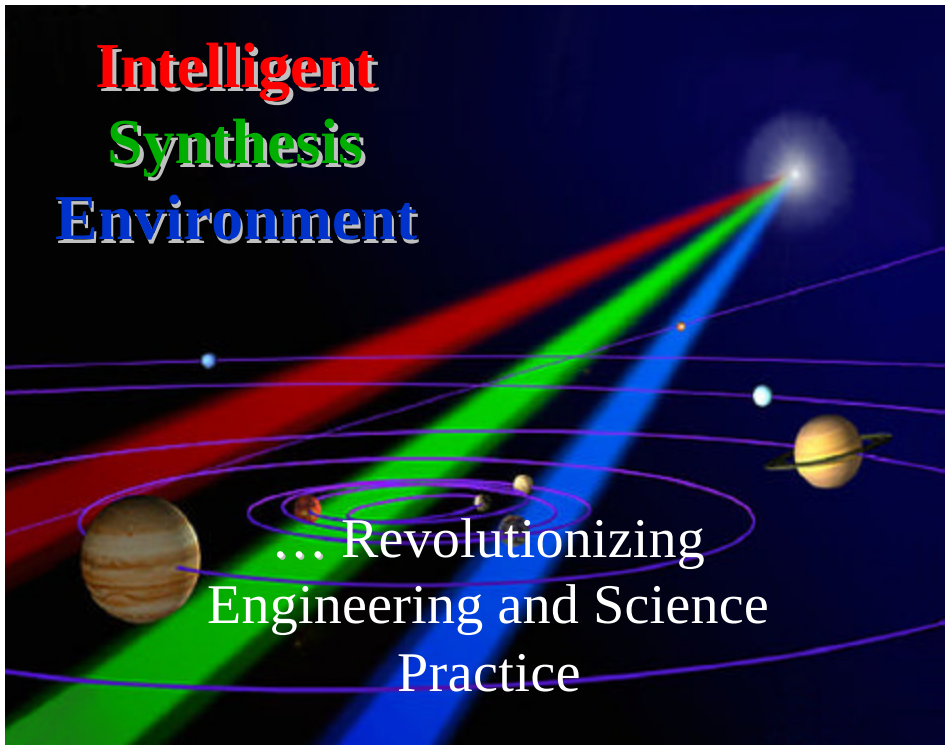
ISE Industry/Academia Workshop
October 28-29, 1999



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Relationship Between ISE Elements

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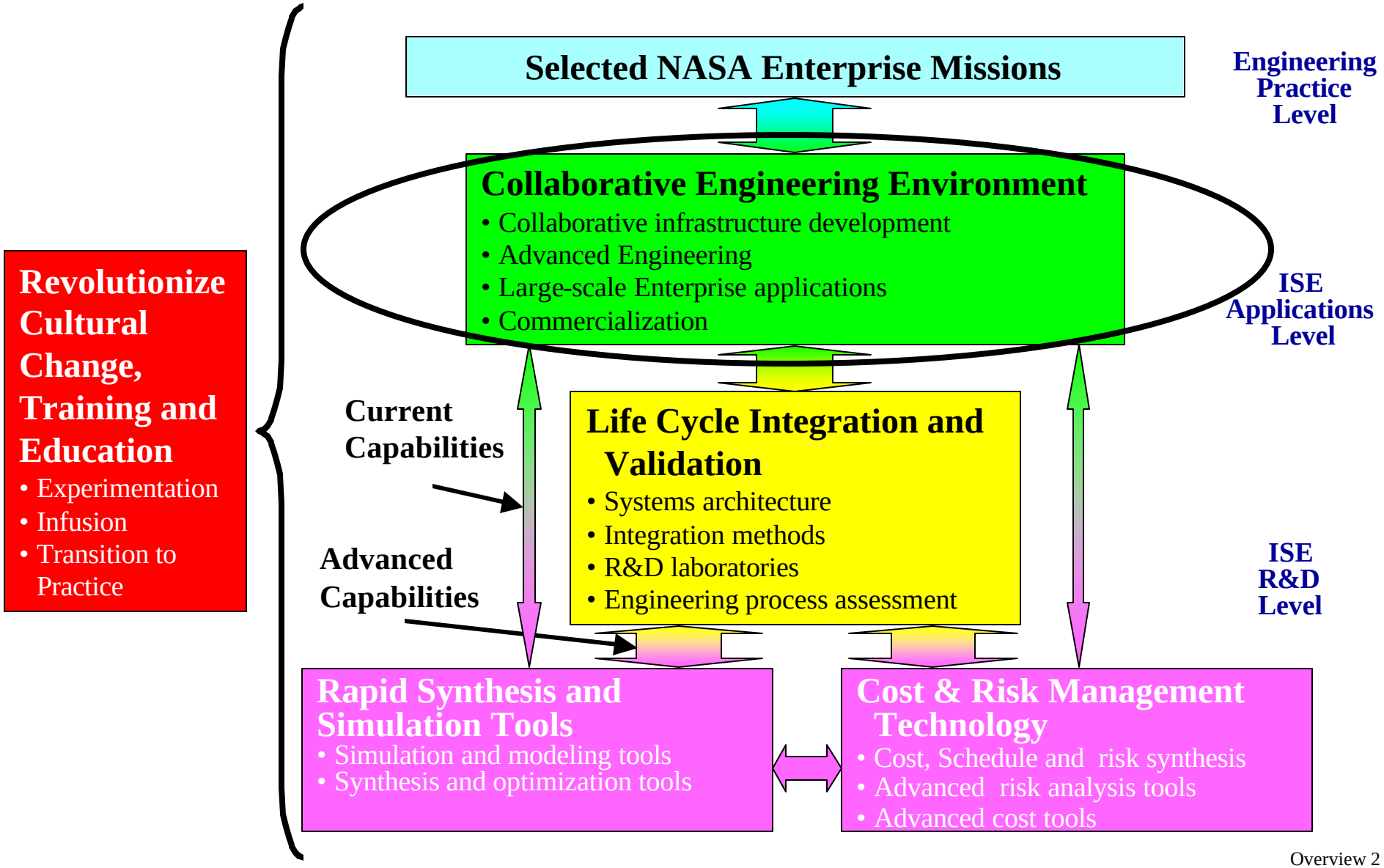

CEE Mission Statement

A NASA-led team with members from other government agencies, industry, and academia that implements ISE processes and technologies (e.g., distributed collaborative teaming, life-cycle analysis) into engineering practice by using applications focused on enterprise requirements.

Aerospace System Concepts Life Cycle Analysis

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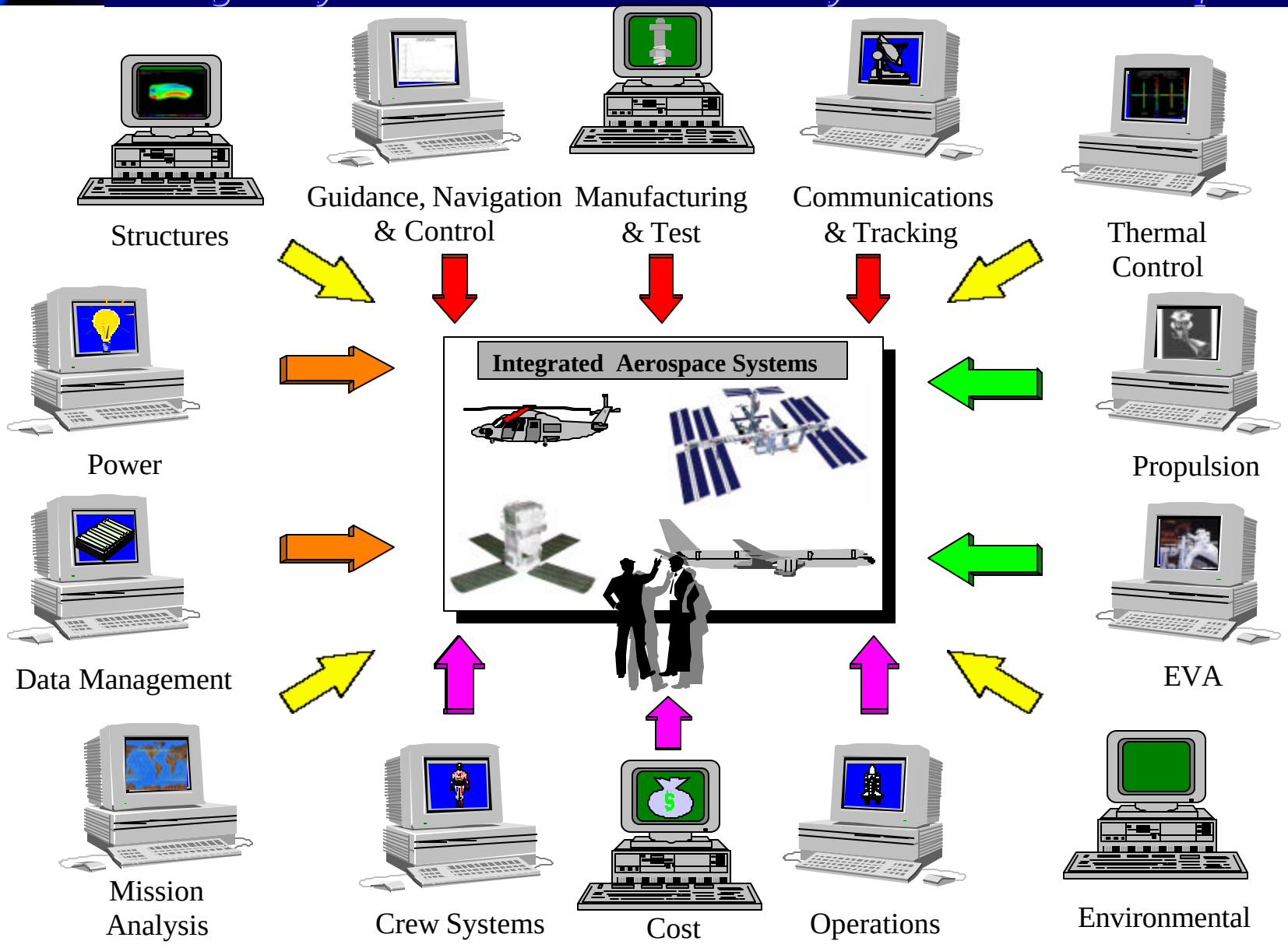

Collaborative Infrastructure Development

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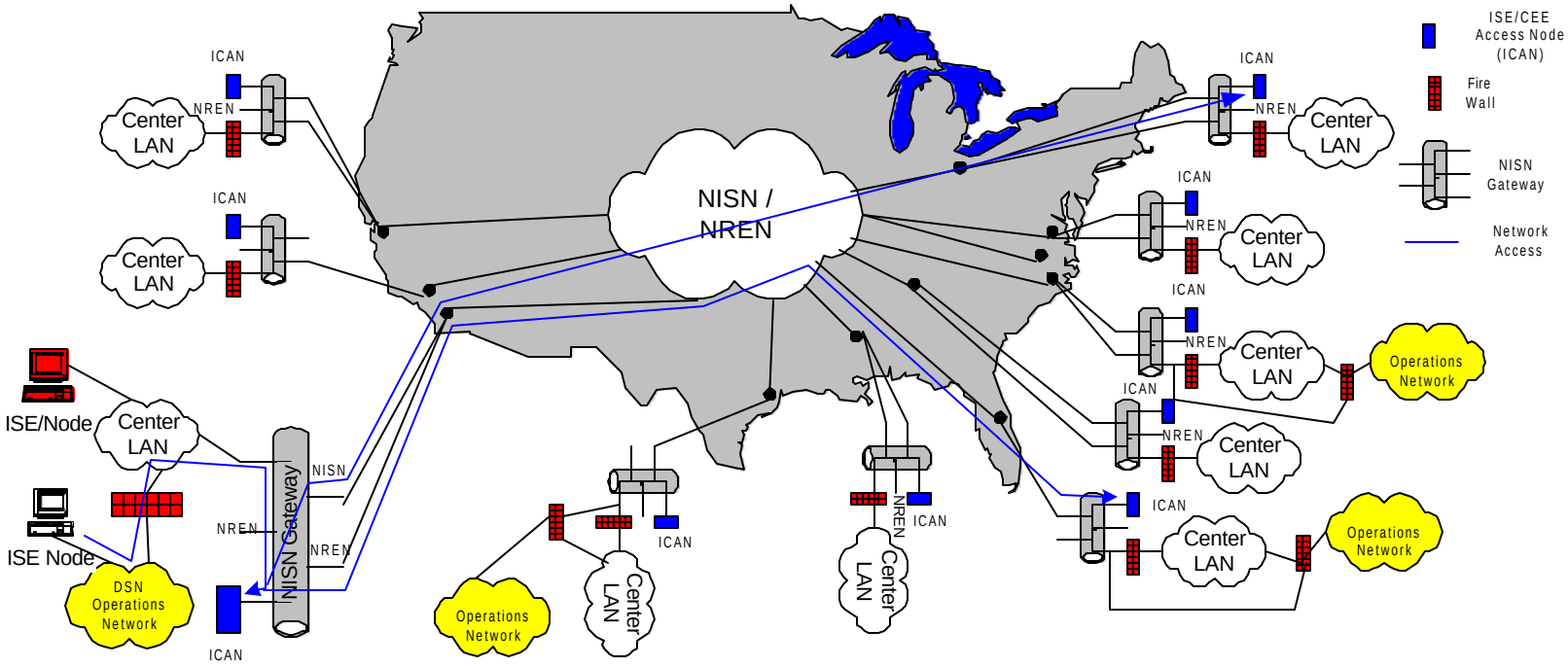

- **Establishing agreements with other NASA computer/network programs (e.g., NASA Integrated Services Network (NISN) and National Research and Education Network (NREN)) and CIO regarding proposed Collaborative Infrastructure network and services, via the IsoWAN* Forum**
- **Establishing agreements with Information Power Grid (IPG) to leverage with the IPG security infrastructure, via the IsoWAN Forum**
- **Establishing agreements with AFRL and DOE**

* **IsoWAN is a coalition of IT organizations working Isolated Wide Area Network issues**

Collaborative Infrastructure Development
Information Security Design

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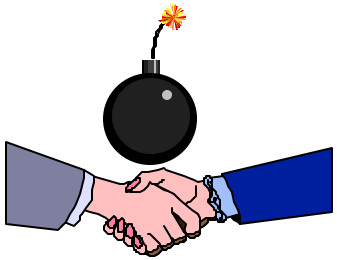
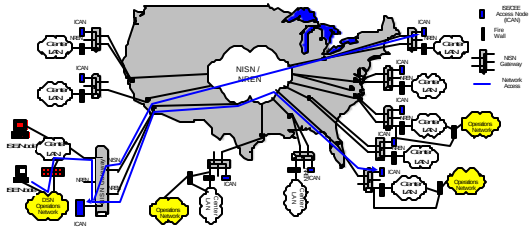
Requirements

- Real-time and non real-time collaboration
  - Security support from data exchange to distributed simulation to video conferencing
- Data locality and accounting
  - Sensitive information kept locally and know who got it.
- Resource priority and protection
  - Resource priority can be controlled and resource usage can be protected.
- Limited "trust model"
  - Do not rely on trust, rely on monitoring
- User friendly vs. Security concerns
  - A secured collaborative environment has to be user friendly too.





Approach

- ISE/CEE Access Node (ICAN):
  - ICAN is like a "virtual visitor center" where business is conducted under ISE and each center's monitoring. Most of the business is conducted inside the "virtual visitor center". Other business has to be approved by ICAN (in real-time, under constant monitoring).
  - Use the Virtual Private Network (VPN) technology to provide end-to-end encrypted traffic between ISE nodes.
  - Provide ISE services such as Distributed Files System (DFS) in secured ICAN area.
  - Resolve advanced protocol (T-120, H.323) through firewall issue with ICAN VPN technology.
- Use agency Public Key Infrastructure (PKI) for unified user authentication
- ICAN DFS will provide data locality and distributed access control.
- Use IPG Globus toolkit to provide user friendly single sign-on for both ISE and IPG resources.
- Use Active Monitoring technology to provide constant real-time vulnerability analysis and intrusion detection.

Approach

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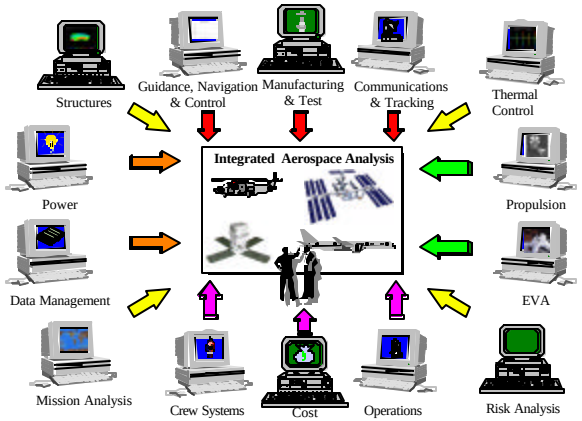
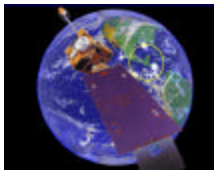


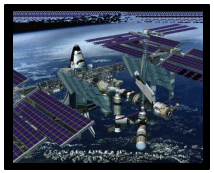
Geographically-distributed, integrated analysis capabilities

New Technologies

Geographically-distributed teams

Large-Scale Applications





Large-Scale Applications (LSAs)

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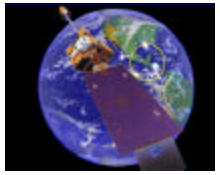
Reusable Space Transportation Systems (MSFC)

Shuttle/International Space Station (JSC/KSC)

Integrated Exploration and Science (JPL/JSC)

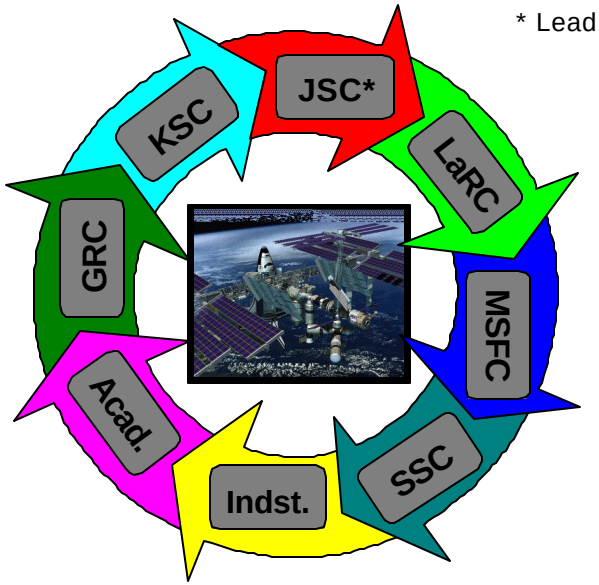


Advanced Earth Observation System (GSFC)

- *Tightly couples NASA R&D Center research products to Development Centers Needs*
- *An integration of computer hardware, software and facilities that enables the development of a design/analysis capability focused on specific mission needs defined and agreed upon by both the ISE Program Office and the affected enterprises*

SCOPE

Create a virtual International Space Station "simulator" that will model the ISS vehicle and system performance in any user-selected configuration and environment.

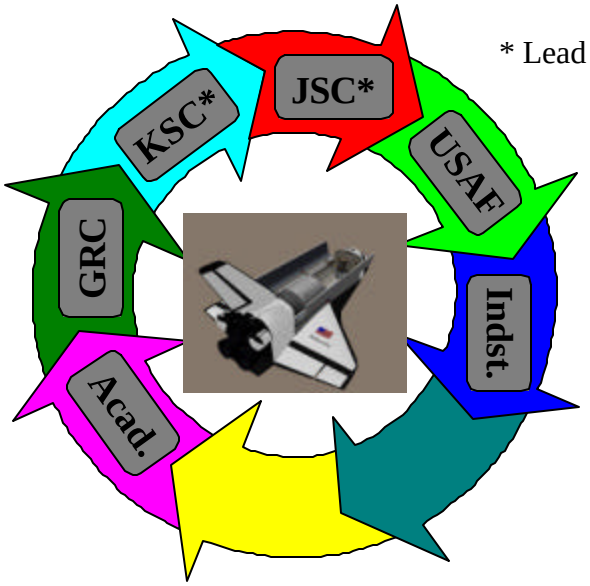


Objective(s)

- **To facilitate the understanding and resolution of complex ISS engineering and operations issues**
- **To decrease to time required to perform ISS analyses (e.g., assembly, system, operations, technology assessments, etc.)**

SCOPE

Ability to support/perform virtual assessments (e.g., technical, operational, programmatic), and incorporation of external data for system visualization



* Lead Centers

Objective(s)

- **To facilitate engineering and process analysis efforts directed towards providing high fidelity program level assessments of existing and future Space Shuttle engineering and operations concepts and upgrade methodologies**
- **To facilitate the integration of payloads into the Shuttle processing**

SCOPE

Develop and demonstrate an integrated environment (w/ distributed users, applications, and data) to support RSTS design from concept analysis through detailed system design, including mission performance, risk, and lifecycle costs.

* Lead Center

Objective(s)

- **To streamline and integrate the RSTS design process, thereby dramatically reducing the design cycle time**
- **To develop a design environment that permits easy transition, both forward and backward, between conceptual designs, preliminary designs and detailed designs**

Advanced Earth Observation System

SCOPE

Mission simulation and simulation-aided-design of science missions - both Earth and Space Science - starting with the definition of the science measurement and phenomenon, and ending with a visualized simulated validation of the systems designed to take the measurement.

* Lead Center

Objective(s)

- **To provide true end-to-end system optimization by including science phenomena in the engineering**
- **To enable end-to-end system conceptualization, formulation and operations performance for missions, instrument systems, spacecraft systems, ground systems, and technology assessments & planning**
- **To support distributed collaboration and use**

Integrated Exploration and Science

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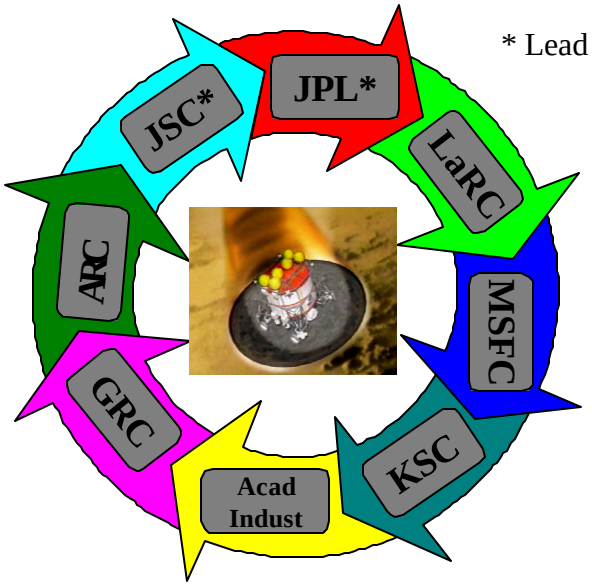
SCOPE

Life cycle simulation of missions to Mars in a realistic Martian environment for the purpose of mission and system design, project and science planning, and mission operations. The collaborative environment will be reusable, shareable, and used for simulating the exploration of Mars and eventually other destinations by both robotic and human exploration initiatives.



* Lead Centers

Objective(s)

- **To facilitate improved collaboration between NASA centers, contractors, academia, and partners on the Mars Program enabling:**
  - **optimized program and cross-enterprise architectures**
  - **reduced mission development time and cost**
  - **radical reduction in time for going from high-level strategic architecture scenario creation to detailed concept definition**

Commercialization Approach

- **Identify with industry areas in the ISE initiative having potential for commercialization**
  - Work with all ISE Elements to identify technologies with commercialization potential
  - Commercialization sub-element will function as the “broker” between other ISE elements and potential industry partners
- **Identify Potential Partnerships by**
  - Identifying existing agency partnerships
  - Sponsoring industry workshops
  - Through the NASA ISE Technologies Alliance
- **Work with NASA organizations having experience in commercialization (e.g., SSC Remote Sensing, LaRC Commercialization Office)**
- **Small Business and Innovative Research (SBIR) mechanisms will be used where applicable**

CEE Technologies/Capabilities Development Requirements

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- Engineering Process Assessment
- Collaboration
- Distributed capabilities
- Simulation
- Visualization
- Persistent Versioning
- Modeling Process
- Human Modeling
- Advanced Tools
- Cost & Risk Tools
- Scheduling Tools
- Tool Integration
- Middleware & standards
- Information Associativity
- Long Term Knowledge Capture
- Configuration management
- Documentation
- Proprietary Data & Proprietary Integration Methods
- Agency Wide Networking
- Firewalls & Security
- CEE Web based User Entry Portal
- Calendaring Service
- Distributed File System
- Document Management (Livelink)
- T-120 Application Sharing
- Audio/Video Bridging
- Product Data Management
- Usability
- Training Requirements
- Utilization Process for Other Applications

CEE Organization Structure

Collaborative Engineering Environment

Element Manager - Douglas Craig (LaRC)
Element Deputy - Donald Monell (LaRC)
Advanced Engineering Team Lead - Michelle Garn (LaRC)

Collaborative Infrastructure Development

Sub-Element Lead - Ed Chow (JPL)

Commercialization

Sub-Element Lead - TBD (SSC)

Advanced Engineering

Sub-Element Lead- Michelle Garn (LaRC)

Advanced Collaborative Environments Team Lead - Joe Hale (MSFC)

Integrated Design and Analysis Team Lead - Johnny Medina (GSFC)

Applications

Application Integration - Don Monell (LaRC)
ISS Team Lead - Valin Thorn (JSC)
STS Team Co-Leads - Mike Conroy (KSC)
Elric McHenry (JSC)
RSTS Team Lead - Chuck Smith (MSFC)
AEOS Team Lead - Carmel Conaty (GSFC)
IES Team Co-Leads - John Baker (JPL)
Eric De Jong (JPL)
Deb Neubek (JSC)

Summary

- **CEE will provide the agency an advanced collaborative engineering environment focused on Large-Scale Applications infusing the technologies developed from the other ISE elements.**
- **CEE has developed broad-base support across the agency and is currently being supported by over 75 people within NASA.**
- **CEE will ensure external partners play an integral role in the planning and implementation of the element**
- **CEE will continue to work with Enterprise/Center personnel and external partners to ensure correct priorities are established for implementation of collaborative engineering capabilities**